Extreme temperatures and comparison, etc.—Continued.

Stations.	Temperature.							Precipitation.		
	Normal.	Mean for 1886.	Departure.	Extremes for 1886. Maximum.	Date.	Minimum.	Date.	Normal.	Total for 1886	Departure.
Missouri Valley.	°	°	°	°		°		*Ins.*	*Ins.*	*Ins.*
Yankton	45.5	45.4	—0.1	102.7	July 13	—27.5	Jan. 9	28.37	29.15	+ 0.78
Huron	41.8	42.1	+0.3	103.6	July 12	—32.5	Jan. 9	24.50	20.25	— 4.25
Omaha	49.5	48.2	—1.3	100.0	July 13	—24.1	Jan. 9	36.47	22.67	—13.80
Leavenworth	53.1	52.4	—0.7	106.8	Aug. 16	—20.5	Jan. 9	39.30	22.25	—17.05
Northern slope.										
Fort Assinaboine	41.3	43.1	+1.8	108.4	July 12	—49.3	Jan. 22	14.17	11.48	— 2.69
Helena	43.2	43.6	+0.4	103.1	July 12	—30.2	Jan. 7	15.38	12.63	— 2.75
Fort Custer	44.1	44.8	+0.7	106.0	July 15	—38.3	Jan. 17	13.94	13.25	— 0.69
Fort Maginnis	40.4	42.5	+2.1	104.0	July 12	—33.2	Jan. 21, 29	12.08	15.44	+ 3.36
Deadwood	41.6	43.7	+2.1	96.0	July 10	—23.7	Jan. 7	26.45	25.97	— 0.48
North Platte	47.6	48.2	+0.6	102.4	July 15	—21.2	Jan. 8	19.57	13.10	— 6.47
Middle slope.										
Denver	49.2	49.3	+0.1	96.3	July 15	—18.9	Jan. 8	15.06	16.07	+ 1.01
Pike's Peak	19.1	19.8	+0.7	57.3	Oct. 1	—29.8	Jan. 7	29.65	29.51	— 0.14
Dodge City	52.7	52.5	—0.2	100.2	July 1 5	—16.2	Jan. 8	21.35	19.35	— 2.00
Las Animas	49.5	49.6	+0.1	104.4	July 3	—21.5	Jan. 8	13.62	12.78	— 0.84
Fort Elliott	54.6	56.0	+1.4	101.7	July 16	— 9.6	Jan. 8	24.59	21.65	— 2.94
Southern slope.										
Fort Sill	60.2	60.0	—0.2	106.0	July 16	— 5.0	Jan. 8	33.33	19.57	—13.76
Fort Davis	60.0	61.0	+1.0	101.7	July 18	— 3.2	Jan. 8	19.50	12.64	— 6.86
Southern plateau.										
Prescott	52.2	52.4	+0.2	96.1	July 7	— 2.0	Nov. 23	15.38	18.78	+ 3.40
Fort Grant	60.1	59.6	—0.5	99.6	July 14	12.1	Jan. 3	16.15	19.32	— 2.23
Fort Thomas	61.5	62.1	+0.6	108.2	Aug. 9	12.4	Jan. 3	11.96	10.86	— 1.10
Fort Apache	52.3	53.8	+1.5	100.6	June 30	— 9.5	Jan. 3	22.69	21.06	— 1.63
El Paso	63.2	63.1	—0.1	111.5	July 22	11.0	Jan. 8	12.31	8.06	— 4.25
Santa Fé	47.9	47.6	—0.3	93.0	July 18	— 6.5	Jan. 8	13.97	15.90	+ 1.93
Yuma	71.9	71.6	—0.3	112.4	July 13	30.4	Jan. 6	2.54	5.35	+ 2.81
Middle plateau.										
Salt Lake City	51.2	51.6	+0.4	99.1	Aug. 11	— 2.0	Jan. 8	17.22	18.89	+ 1.67
Winnemucca	49.4	49.1	—0.3	100.2	July 11	0.6	Nov. 16	9.98	8.16	— 1.82
Northern plateau.										
Spokane Falls	47.3	48.7	+1.4	100.3	July 16	—10.5	Jan. 20	21.75	15.86	— 5.89
N. Pac. coast region.										
Olympia	49.5	50.2	+0.7	91.9	June 2	15.1	Jan. 17	54.22	48.13	— 6.09
Portland	52.5	52.6	+0.1	95.0	June 2	15.0	Jan. 19	52.40	38.76	—13.64
Roseburg	52.2	52.7	+0.5	100.0	July 18	22.3	Nov. 16	35.12	35.17	+ 0.05
Mid. Pac. coast reg.										
Cape Mendocino	51.7	51.8	+0.1	85.4	Sept. 9	33.7	Jan. 17	18.78	22.35	+ 3.57
Sacramento	59.4	58.8	—0.6	105.0	July 14	27.5	Jan. 7	23.21	18.17	— 5.04
San Francisco	55.8	56.1	+0.3	93.9	Sept. 8	41.0	†	23.97	20.02	— 3.95
S. Pac. coast region.										
Los Angeles	60.8	61.1	+0.3	98.1	July 15 Aug. 10	32.0	Jan. 2	17.31	17.20	— 0.11
San Diego	60.6	60.5	—0.1	82.5	Aug 29	34.8	Jan. 2	9.08	15.35	+ 6.27

* Two days of March and eleven days of April missing.
† January 2d, 3d, 4th, 8th; February 28th; March 18th.

STATE WEATHER SERVICES.

The following is an extract from the January, 1887, report of the "Alabama Weather Service," P. H. Mell, jr., of the Agricultural and Mechanical College, Auburn, director:

The low temperature prevailing throughout the month has rendered January memorable. The average for the state shows a fall of 5°.7 below the normal. There were four cold waves predicted, and all verified with remarkable accuracy, except the one predicted on the 6th. The second occurred on the 10th, the temperature falling from 45° to 20°; the third struck the state on the 18th, when the temperature ranged from 65° to 22°; the fourth reached the state on the 27th, and the temperature fell from 56° to 28°. These cold waves are so accurately predicted now, the people watch the display of the signals with considerable faith and interest.

The precipitation was very nearly normal, 0.26 inch below. There was a slight fall of snow throughout the state on the 1st, 4th, and 5th.

Carrollton furnishes the following note of interest: "At sunrise on the 12th there was an intense fog and no frost. At 9 o'clock the fog suddenly disappeared and the ground at that hour was covered with a thick white frost."

High winds occurred at frequent intervals during the month, and some of them swept with dangerous velocities. Trinity and Tuscumbia report a heavy wind and rain storm on the 13th, attended with hail, thunder, and lightning. The wind blew down fences and trees.

Summary.

Mean temperature, 42°.3; highest temperature, 77°, at Eufaula, on the 31st; lowest temperature, 1°, at Gadsden, on the 3d; range of temperature, 76°; greatest monthly range of temperature, 59°, at Gadsden; least monthly range of temperature, 50°, at Fayette; mean daily range, 15°.7; greatest daily range of temperature, 47°, at Eufaula, on the 19th; least daily range of temperature, 0°, on the 9th, at Centre, Demopolis, Gadsden, and Valley Head, and at Mount Willing, on the 8th.

Mean depth of rainfall, 4.22 inches; mean daily rainfall, 0.14 inch; greatest depth of monthly rainfall, 7.55 inches, at Greenville; least depth of monthly rainfall, 2.38 inches, at Gadsden; greatest daily local rainfall, 5.00 inches, at Fayette, on the 23d.

Average number of days on which rain fell, 6; average number of cloudy days, 10; average number of fair days, 10; average number of clear days, 11.

Prevailing direction of wind, south.

The following extracts are from the January, 1887, report of the "Arkansas Weather Service," Mr. George R. Brown, of Little Rock, director:

Heretofore there has been no reliable data of the climate of Arkansas published, except at Little Rock and Fort Smith, and in a few of the local papers. Persons away from the state have been guided entirely by this. Situated as the state is, with mountains, valleys, and extensive prairies, it is obvious that records kept at a few points can give but a very imperfect idea of the climate of the state. It is now desired to obtain reports from every county. These reports can be made with very little trouble and with little expense. Some few have sent in reports for January, and more have promised to do so for February.

* * * * * *

The highest temperature reported was 74°, at Mount Ida, on the 20th; lowest, —13°, on the 8d. It was —8° on the 9th at Eureka Springs, and —2° on the 2d. At Conway on the morning of the 10th it was 0°, and —6° at Van Buren on the 3d.

The cold-wave flag was up at the 1st of the month for a cold wave which reached the northern part of the state on the 1st, and was general throughout the state from the 2d to 4th; the lowest temperature recorded being —13°, at Mount Ida on the morning of the 3d, —2° at Eureka Springs, and 7° at Little Rock.

Snow was reported on the 2d at Pine Bluff, Mount Ida, and Little Rock. Snow and sleet on the 8th at Pine Bluff, Mount Ida, Conway, Eureka Springs, Little Rock, and Judsonia.

Thunder-storms were frequent in different parts of the state from the 18th to the 25th, especially on the 21st and 22d; these storms were preceded by brisk winds on the 12th and 13th in nearly all parts of the state, and during this time the temperature was generally above the average for the season.

The greatest rainfall reported was on the 22d, Mount Ida, 2 inches, and Little Rock, 1.46 inches.

The following is an extract from the January, 1887, "Monthly Review of the Illinois Weather Service," Col. Charles F. Mills, of Springfield, director:

Temperature.—The mean temperature of the state, 20°.1, was 2°.7 below the January normal for thirteen years (January, 1875, 15°.4, being the coldest, and January, 1880, 40°.8, the warmest). The mean for the northern counties was 14°.5; central, 19°.7; and southern, 27°.6. The lowest mean temperature reported was 10°.9, from Belvidere; the highest, 33°.4, from Cairo (a range of 22°.5 in 375 miles of territory, or a fall of one degree for each sixteen and two-third miles of latitude going south).

There were three severe cold waves, on 2–3d, 7th, and 18th; the minimum temperature reported from that of the 2d being 26° below zero; of the 7th, 32° below; and of the 18th, 16° below. The northern counties were affected most by that of the 7th, and the central and southern counties by that of the 2–3d.

The mean temperature was nearly normal, except in the extreme northern counties, where it averaged about 6° below.

The highest temperature reported during the month was 66°.1, on the 20th, from Cairo; the lowest, —32°, on the 7th, from Lacon.

The cold waves predicted, were, as a rule, justified.

Precipitation.—The average precipitation for the state for the month, 1.82, was 0.30 below the normal January precipitation for past ten years. The average for the northern counties, 2.64, was 0.80 above; central, 1.27, was 0.35 below; and southern, 1.39, was 1.41 below.

The remarkable feature of the month was the number of well-defined storm-centres that passed over the state (4th, 13th, 16th, 20th, 22–23d, and 24–25th) and the general deficiency in precipitation, notwithstanding.

A general thunder-storm, accompanied by heavy rain, and in several counties by hail, prevailed on the 22d. Northwest to southwest winds prevailed.

The snowfall was comparatively light, except in the extreme northern part of the state, where it ranged from ten to twenty-seven inches. About six inches fell in the central and three in the southern counties. Frosts were general, except on the 22d.

The following is an extract from the January, 1887, report of the "Minnesota Weather Service," Prof. Wm. W. Payne, Carleton College, Northfield, director:

The month has been very severe, the temperatures were remarkably low, and the snowfall rather heavy in some localities. There were five periods of general precipitation throughout the state, these occurring from the 3d to the 5th, 10th to 16th, 19th and 20th, the 24th and the 29th. The greatest amount of snow fell during the second of these periods. With these exceptions, fair weather prevailed.

Temperature.—The mean for the month was 0°.1 above zero. At Saint Paul it was 9°.8 below the average of the corresponding month for sixteen years, and the lowest since January, 1875, when it was 2°.3 below zero. At Saint Vincent the mean was 6°.7 below the average, and the coldest month but one since the station was established in 1873, January, 1883, being 0°.7 colder. Duluth was 7°.9 below the average, and La Crosse 4°.8 below. The lowest temperature recorded at any station was 42°.2 below zero on the 6th at Saint Vincent, while on the succeeding day Rochester reported 42°.0 below; Albert Lea and Eau Claire 40° below. The lowest temperatures occurred mainly

during the periods of the 1st and 2d, 5th to 10th, 17th and 18th, 25th and 26th, 30th and 31st, the mean temperature on these days being considerably below zero. In the northeastern portion of the state the minimum temperature for the month occurred during the fifth period, and in other portions during the second period. The maximum temperatures occurred mainly on the 27th and 28th; the highest was 41°.0, and reported on the former date from La Crosse. The monthly range of temperature for the state was 83°.2; the greatest range for any station, was 82°.0, at Rochester, and the least range, 61°.8, at Duluth.

Precipitation.—This has been entirely in the form of snow. In Minnesota there was an excess over the average of previous years, but considerably below that of the corresponding month of 1886. At La Crosse the total fall (in inches) was only 0.25; which is the lowest since the station was established in 1878, and 0.99 below the average. At Saint Vincent there was an excess of 0.35; Duluth, 0.52; Saint Paul, 0.81. The greatest amount of precipitation was 2.25 inches, reported from Excelsior. Other stations reporting over an inch were Saint Paul, 1.79; Eau Claire, 1.75; Duluth, 1.62; Red Wing, 1.22; Mankato, 1.15; Northfield, 1.01. The snowfall was about one-fifth as much as fell in January, 1886. North of a line taken from Mankato to Red Wing, the fall amounted to over ten inches, while to the west and south it was considerably less. At the close of the month, from five to twenty-two inches of snow remained on the ground, the greatest amount being in the central portion of the state.

The following is from the January, 1887, report of the "Mississippi Weather Service," Prof. R. B. Fulton, of the University of Mississippi, Oxford, director:

Temperature.—The mean temperature for the state was 44°; 41° for the northern portion, 44° for the central portion, and 48° for the southern portion, which is 3° above the average of last year. The maximum temperatures occurred on the 21st and 31st, the minimum occurred at every station in the state on the 3d.

Precipitation.—The following heavy rainfalls (1.00 or more) were reported: Brookhaven, Lincoln county, 2.48 inches, on the 23d, and 1.20 on the 29th; Mobile, 1.09 inches, on the 23d; Memphis, 1.27 inches, on the 22d, 1.84 on the 23d, and 1.56 on the 28th; Agricultural and Mechanical College, Oktibbeha county, 1.00 inch, on the 23d; Vicksburg, Warren county, 1.09 inches, on the 29th; Kosciusko, Attala county, 1.00 inch, on the 24th; Oxford, Lafayette county, 2.30 inches, on the 22d, and 1.83 on the 28th; Biloxi, Harrison county, 2.17 inches on the 23d; Astonish Plantation, Wilkinson county, 1.62 inches, on the 22d, and 1.34 on the 28th; Greenville, Washington county, 1.70 inches, on the 23d, and 1.35 on the 29th.

Summary.

Mean temperature, 44°; highest temperature, 77°, on the 30th, at Greenville; lowest temperature, 2°, on the 3d, at Batesville; monthly range of temperature, 75°; greatest daily range of temperature, 47°, at the Agricultural and Mechanical College, on the 20th; least daily range of temperature, 1°, at Holly Springs, on the 22d.

Mean monthly rainfall, 3.78 inches; greatest monthly rainfall, 4.99 inches, at Oxford; least monthly rainfall, 2.36 inches, at the Agricultural and Mechanical College; average number of days on which rain fell, 7.

The following is an extract from the January, 1887, report of the "Missouri Weather Service," Prof. Francis E. Nipher, Washington University, Saint Louis, director:

The rule that a cold January and February follows a cold December has so far been verified. January, 1887, has had a mean temperature of 27°.2, which is 4°.6 below the normal temperature. The lowest temperature was —15°.1 on the 2d, and the highest was 62°.5, on the 20th. The temperature fell below zero on four days; below the freezing point on twenty-one days; and did not rise above freezing on twelve days during the month. The mean temperatures of the decades were 9°.6 for the first; 32°.3 for the second; and 38°.6 for the third.

The rainfall and melted snow was only 0.70 of an inch, which is 1.39 inches below the normal for Saint Louis. Snow fell on five days during the month, which all amounted to about 0.35 inch when melted.

The highest temperatures generally occurred on the 20th, and the lowest on the 2d.

At Craig the temperature fell below zero on thirteen days; on nine days the mean temperature was below zero, and fell below freezing on every day of the month. Louisiana reports the temperature below zero on twelve days, and not rising above on six days during the month.

The rainfall in the state was over two inches in central and southern portions, diminishing to less than one inch in the northwest. The maximum fall occurred at Springfield, it being 2.60 inches.

The following is from the January, 1887, report of the "Nebraska Weather Service," Prof. Goodwin D. Swezey, of Doane College, Crete, director:

The month of January, 1887, has been remarkable for unusually low temperatures, for absence of rain, and for light snowfall, although the number of days of snow was as large as usual.

Precipitation.—The precipitation has been most deficient in the central part of the state, being a small fraction of an inch of melted snow, representing only a few inches of snowfall. From southern Pawnee county, only, is reported more than an inch of precipitation; in the eastern and western parts of the state generally a little less than an inch. On the whole the precipitation has been less than for any January of the past ten years.

Temperature.—The mean temperature of the month has been 18°.1, which is 4°.6 below the normal. The average noon temperature has been 23°.5, the normal for noon temperature of January being 27°.4. There has been an unusual number of cold days, there being thirteen days in which the thermometer went below zero against an average of 8.6, while every day the temperature went as low as the freezing point. The highest temperature recorded was 59°.5, on the 21st, at Crete, and the lowest was 30° below zero, at Valentine, on the 6th.

Three severe cold waves prevailed; the first on the 1st and 2d, when the barometer rose to the unusual height of 30.944 inches at the central station, and the temperature reached the lowest point of the month for the eastern part of the state, being —21°.8 at Crete, —21°.9 at Omaha, and —22° at Lincoln. The second passed on the 8th, when the lowest temperature of the month for the western part of the state was reached, —30° at Valentine and —21°.4 at North Platte. The third cold wave, less severe than the others, passed on the 18th.

Wind.—No very severe wind storms have been felt, the highest velocity reported being forty-four miles at Valentine.

The following extracts are from the January, 1887, report of the "New England Meteorological Society," Prof. Wm. H. Niles, of the Institute of Technology, Boston, Massachusetts, president:

Reports for the month were received from one hundred and fifty observers.

The mean temperature of the month was decidedly below the average, as was generally the case throughout the country; the first nineteen days were chiefly responsible for this, as the last twelve were generally warmer and contained two periods of decidedly high temperature. The precipitation was strongly in excess of the average for January, being snow in greatest part during the colder days, and rain afterwards, by which the previous abundant snow was greatly reduced.

The weather of the month was affected by the passage of fourteen cyclonic storms.

January 1st had moderate temperature (maximum, 30° to 40) and general rain, with snow in the north, lasting over to the 2d in Maine, as the last storm of December moved along the coast. Fair weather and northwest winds followed, with severe cold on the 4th (zero in south, —25° to —30° in north), succeeded by two storms passing either side of New England on the night of the 5–6th, giving snow, except at southern coast stations, with moderate temperature again. * * * The 17th brought another snowfall, with some rain, as a strong cyclonic storm moved from Lake Huron down the Saint Lawrence, followed by brisk northwest winds and a rapid fall of temperature through the 18th to the morning of the 19th, when the third cold spell gave the general minimum of the month: 0° to 4° on the southern coast and islands; —15° to —35° in the interior; Post Mills, Vermont, had —42°, with a spirit thermometer; Quincy, New Hampshire, —36°; Mount Washington, New Hampshire, —35°. Many observers report striking instances of inverted temperatures between hills and valleys; Waterbury, Connecticut, found strong variations in a distance of half a mile, varying in very regular graduation from —25° at the lowest point to zero two hundred feet higher on the the hills. At Windsor, Vermont, two adjacent self-registering thermometers gave —33°.3 and 32°.9 (corrections applied); other thermometers on low lands gave —38° to —40°. At Lexington, Massachusetts, one thermometer, eight feet from the ground, read —15° at 7 h.; another, thirty feet from ground, on the same building, read —7°; the two agreed when placed together. The low temperature of this date was curious in occurring with high pressure (30.5) on the Atlantic off Georgia, and low pressure (29.6) north of Lake Huron.

Only clouds reached us from this northern low pressure area, but on the 20th a stronger storm, the tenth, came from the Lakes, giving general cloudiness, southerly winds, snow in the north, with moderate temperatures, rising through the night to the 21st, when maxima of 40° to 48° were commonly noted. At Windsor, Vermont, the temperature thus rose 81° in about forty-two hours. The 21st was clear and pleasant, with a moderately cold night. The 22d clouded over on the approach of the eleventh cyclonic storm from the southwest, giving warm southerly "sirocco" winds (maximum for the month, 55° to 58°) and rain on the 23d and 24th, under which the snow on the ground rapidly diminished. The change to colder, westerly winds came about noon, at Bethlehem, New Hampshire, and at 14 h. 20 m. at Cambridge; thunder was heard at 12 h.–13 h. in northern Rhode Island, and 13 h.–14 h. in eastern Massachusetts. * * * Lightning was seen at Taunton, Massachusetts, about midnight, 28–29th. The highest temperature was reached in the morning (about 6 h.) of the 29th in northern New Hampshire, and at 13 h.–14 h. at Cambridge; the westerly winds which followed failed to bring severe cold, as they were soon reversed by another storm (the fourteenth of the month) passing down the Saint Lawrence Valley on the 30th, continuing the clouds and rain of the previous days. The 31st was fair, but halos at noon announced the coming of another storm, that reached us from the southwest on February 1st.

A brilliant meteor was seen at several stations moving slowly northward at 17 h. 14 m. on the 8d.

Summary for 1886.

The most noteworthy features of the year 1886 were the severe cold wave of January 11th and 12th; the heavy rains of February 10th to 14th; the high winds of February 25th to March 3d; the deficiency of rainfall and the moderate mean temperatures of June, July, and August; the moderate number of thunder-storms in these summer months, and the occurrence of several violent

thunder-storms in southern New England late in the autumn; and heavy snowfall early in December, marking the opening of a severe winter.

The following is an extract from the January, 1887, report of the "New Jersey Weather Service," Prof. George H. Cook of the Agricultural College, New Brunswick, director:

The mean temperature at ten stations, Atlantic City, Dover, Moorestown, Newark, New Brunswick, New York, Philadelphia, Princeton, Somerville, and South Orange, as compared with the normal January mean temperatures as given in Signal Service reports, Prof J. C. Smock's tables, and other reliable sources, shows that the mean temperature throughout the state was but a half degree below the normal.

The first ten days were very cold; the following were warmer, but still quite cold; and the last eleven were comparatively comfortable, considered in the light of history, as reflected by our valuable observer at Somerville, who says: "Thirty years ago, on Sunday, January 16th, there was a snow storm remarkable for the intense cold and amount of snow. Snow fell three feet deep on a level on Main street, Somerville. Cars did not get up from New York until Wednesday evening, January 19th. A train of eight engines, a mail car, and a passenger car came as far as this place. The mercury was four degrees below zero. People rode in sleighs to church from over the river for thirteen Sundays after the storm, but sleighing in town ceased two weeks sooner."

The maximum temperature for the month was reported at Red Bank, 78°, on the 23d, and the lowest at Blairstown, 6° below zero, on the 8th. Matawan showed the highest mean temperature for the month, 33°.7, while Blairstown recorded the lowest, 22°.7.

Rain or snow fell at each station on an average of ten days out of thirty-one. Sixteen stations noting amount of cloudiness report an average of twelve days when the amount of cloudiness averaged eight or more on a scale of zero to ten. The greatest amount of sunshine was reported at Atlantic City, Red Bank, Egg Harbor City, and Philadelphia, while Dover recorded the greatest number of cloudy days. The precipitation was unevenly distributed. Out of a list of eleven stations where normals have been determined eight stations report an excess, while three show a deficiency. The average excess throughout was 0.97 inch. The ground was reported perfectly free from snow, except in the northern counties, at the end of the month, and the frost was out in a number of places.

Thunder-storms.—The observer at Lockton reports thunder and lightning at 3 a. m. of the 14th, and the Princeton observer notes a thunder-storm at 2 a. m. on the 13th.

Navigation.—The ice moved out of the Raritan, at Somerville and New Brunswick, on the 15th. The ice in Paulin's Kill, at Blairstown, broke up and flowed out on the 29th. Ice in the Delaware, at Billingsport Front lighthouse, broke up on the 24th, and at the end of the month the river was clear.

The following meteorological summary for January, 1887, is from the "Bulletin of the North Carolina Department of Agriculture." The weather service is under the direction of Dr. Charles W. Dabney, jr., of Raleigh:

Temperature.—The mean temperature of the state was 39°.1. The characteristic features of the first ten days were decidedly cold; the lowest temperature for the month at many points occurred during this period, especially at Salem, Forsyth county, where the minimum, —4°, was recorded on the 6th. This can be regarded as the lowest in the state during the month, but it was not, however, the coldest day, which occurred on the 3d, when a mean of 17° for all points was recorded. The minimum at Asheville, on this date, stood at 2°, and at Salem, 4°. Minimum temperatures for the state ranged from —4° at Salem, central district, to +15° at Wilmington, eastern district.

With the exception of a second cold snap, 18th to 19th, inclusive, the temperatures were generally normal, or abnormally high, and continued so to the end of the month.

Precipitation.—The average precipitation of the state for the month was 2.92 inches; for the eastern district, 2.81 inches; for the central district, 2.49 inches; and for the western district, 3.94 inches. The precipitation was generally distributed throughout the month, and most points in the state were favored with a fair average rainfall. The heaviest rains, or snows, fell on the 1st, 5th, 13th, 14th, 17th, 23d, 24th, 29th, and 30th. There were eight days during the month noted for an entire absence of rain. Sleet storms prevailed at Raleigh and Reidsville on the 1st, at Weldon on tne 5th, at Mount Pleasant on the 6th, at Raleigh on the 10th, at Tarborough on the 26th.

The following meteorological summary for January, 1887, is from the report of the "South Carolina Weather Service," Hon. A. P. Butler, Commissioner of Agriculture for South Carolina, director:

Mean temperature, 40°.1; highest temperature, 73°, at Cheraw, on the 23d; lowest temperature, 5°, at Spartanburg, on the 4th; range of temperature, 68°; greatest daily range of temperature, 38°, at Spartanburg, on the 14th; least daily range of temperature, 2°, at Stateburg, on the 8th.

Mean depth of rainfall, 2.80 inches; greatest monthly rainfall, 4.48 inches, at Aiken; least monthly rainfall, 1.36 inches, at Spartanburg; greatest daily rainfall, 1.08 inches, at Charleston, on the 13th; least daily rainfall (inappreciable), at several stations on the 18th, 23d, and 26th.

Average number of rainy days, 8.

Killing frosts occurred on the 1st to 13th, inclusive, also on the 15th, 16th, 18th, 19th, 20th, 25th, 26th, 27th, 28th, and 31st.

Snow fell generally in the upper and middle divisions of the state on the 5th and 7th; it was also reported in the upper counties on the 8th and 9th. Sleet was reported on the 5th, 7th, and 9th.

Thunder-storms.—On the 23d, at Abbeville, accompanied by high wind, heavy rain, and hail; on the same date at Spartanburg and Yorkville. The observer at Yorkville reports: "From 10 p. m. of the 23d until 4 a. m. of the 24th a rain storm, accompanied by vivid lightning and high wind, prevailed. The wind did some damage to fencing and to small unprotected out-houses.

The following is an extract from the "Tennessee State Board of Health Bulletin" for January, 1887, prepared under the direction of J. D. Plunkett, M. D., President of the State Board of Health. The weather report is prepared by H. C. Bate, Director of the State Meteorological Service:

The meteorological features for January were the severe thunder-storms of the 13th and 23d, the high winds which prevailed at intervals during the month, and the small proportion of cloudiness.

The mean temperature was 37°.2, which was several degrees higher than the January mean of any of the three preceding years. The highest temperature was 78°, recorded on the 21st, and was above the maximum recorded in January of the two preceding years, and only 1° below the maximum recorded for the corresponding month in 1884. The minimum temperature was —2°, recorded on the 2d and 3d, and was the highest minimum recorded in January during the past three years, the next highest being —5°, in 1885. The proportion of cloudiness for the month was the smallest during the past three years.

The mean precipitation for the month was 4.71 inches, which was considerably below the January mean of the past three years, the highest being 6.96 inches, in 1885; of this amount the eastern division received an average of more than 4.50 inches, the middle division an average of nearly 5 inches, and the western division a little more than 4.50 inches. The rains of the 9th, 13th, 23d, and 25th were general, and those of the 23d, 28th, and 29th were very heavy; that of the 23d especially so, the fall amounting to an average of 1.72 inches for the entire state.

Summary.

Mean temperature, 37°.2; highest temperature, 73°, on the 21st, at Riddleton; lowest temperature, —2°, on the 2d, at Nashville, and on the 3d, at Farmingdale; range of temperature, 75°; mean daily range of temperature, 16°.3; greatest daily range of temperatnre, 39°, on the 8th, at Cookeville; least daily range of temperature, 2°, on the 1st, at Ashwood; on the 18th, at Howell; and on the 22d, at Covington; mean of maximum temperatures, 68°.4; mean of minimum temperatures, 3°.1.

Average number of clear days, 12.4; average number of fair days, 9.6; average number of cloudy days, 9.

Mean depth of rainfall, 4.71 inches; mean daily rainfall, 0.152 inch; days of greatest rainfall, 9th, 13th, 23d, 28th, 29th; day of greatest rainfall, 23d.

NOTES AND EXTRACTS.

SUN SPOTS AND METEOROLOGICAL PHENOMENA.

[Prepared under direction of officer in charge of Review Division by Jr. Prof. H. A. HAZEN.]

In answer to many inquiries regarding a probable connection between sun spots and meteorological phenomena, there is given in this REVIEW, on the back of chart i, a series of curves showing monthly values for fifteen years of the following elements, viz.: (curve A) sunspots, (B) diurnal range of magnetic declination, (C) monthly range of air pressure, (D) mean monthly temperature, (E) clouds, (F) precipitation. Tables I and II give the data from which these curves have been drawn, and these will enable any one to study the original data as he may wish. The following description of the sources of information and the manner of discussion is given:

The period covered by the fifteen years is that from January, 1872, to December, 1886, comprising nearly all of the observations of the Signal Service. Wolf's sun spot numbers have been taken from January, 1872, to July, 1878; from August, 1878, to May, 1877, the Greenwich observations of sun spots have been used, and from June, 1877, to December, 1886, the observations of Prof. D. P. Todd, as published month by month in past MONTHLY WEATHER REVIEWS, have been utilized. The first two have been reduced to correspond, as nearly as possible, with the values in the longest series.

The mean monthly diurnal range of magnetic declination is the mean of the values at Milan and Prague, as these were nearly identical. In 1884 and 1885 the values at Prague, only, were at hand. The remaining elements are taken from the Signal Service observations at Saint Paul, Davenport, Saint Louis, Cairo, Memphis, Vicksburg, and New Orleans. A mean of these seven stations would serve to eliminate local peculiarities, and give a much more satisfactory result than a single station could. These are given in Table I. The fifteen-year normal for each month is obtained in the usual way.

The general mean is then obtained by finding the mean of these twelve normals. The algebraic difference between the general mean and the normal for any one month may be regarded as a correction to be applied to each of the fifteen monthly values. By the application of the correction to each month the seasonal variation is approximately eliminated. The correction for the seasonal variation of the meteorological elements is placed at the foot of each month in Table I. It was found that the corrected monthly values when projected gave curves which were difficult to compare, because of great irregularities from month to month. In order, then, to smooth out many of these sudden turns, a mean of each five consecutive months has been taken, and these are shown in Table II, from which the curves are drawn.